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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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APPLIED MATERIALS, INC.
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EXAMINER	
QUASH, ANTHONY G	

ART UNIT	PAPER NUMBER
2881	

DATE MAILED: 07/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application N .	Applicant(s)	
	10/091,351	MARVIN FARLEY ET AL	
	Examiner	Art Unit	
	Anthony Quash	2881	

-- The MAILING DATE of this communication appears on th cover sheet with th correspondence address --

Period f r R ply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 June 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 2 recites the limitation "second portion" in line 13. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 11-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Horsky [372]. As per claim 11, Horsky [372] discloses an indirectly heated cathode for an ion source comprising a button member having a front face (322) for emitting thermionic electrons, when in use, to form a plasma, the button member having a rear face (320) opposite to the front face (322) for exposure to electron heating in use, the rear face (320) having a central portion (164) and an exposed surrounding portion (326), the

central portion (322) protruding rearward relative to the surrounding portion (326). See Horsky [372] abstract, figs. 2, 4,6a-7, 13a-13b, col. 1 lines 10-16, 40-67, col. 2 lines 10-67, col. 3 lines 1-30, col. 4 lines 30-55, col. 5 lines 1-30, col. 6 lines 35-60, col. 7 lines 5-65, col. 8 lines 20-35, col. 10 lines 13-67, and col. 11 lines 25-55.

As per claim 12, Horsky [372] discloses the button member comprises a collar piece (326) and a slug (164) piece secured in the collar piece (326) the slug (164) piece protruding rearward to form the central portion (164) of the rear face (320). See Horsky [372] figs. 6-7.

As per claim 13, Horsky [372] discloses the slug (164) piece providing a central portion (164) of the front face (322) of the button member and the collar piece (326) provides a peripheral portion (326) of the front surface (322) surrounding the central portion (164), the slug (164) piece being secured in the collar piece (326) so as to provide a temperature difference between the slug (164) piece and the collar piece (326) when the central portion (164) of the rear face (320) of the button member being exposed to electron heating. See Horsky [372] abstract, figs. 2, 4,6a-7, 13a-13b, col. 1 lines 10-16, 40-67, col. 2 lines 10-67, col. 3 lines 1-30, col. 4 lines 30-55, col. 5 lines 1-30, col. 6 lines 35-60, col. 7 lines 5-65, col. 8 lines 20-35, col. 10 lines 13-67, and col. 11 lines 25-55.

Claim 16 is rejected under 35 U.S.C. 102(b) as being anticipated by Horsky [372]. As per claim 16, Horsky [372] a method of creating a plasma for use in ion implantation comprising providing an arc chamber (76) with an indirectly heated button cathode (124) with a front face (322) for emitting thermionic electrons into the arc

chamber (76) for acceleration therein to form a plasma, forming a rear face (320) of the button member, opposite to the front face (322), with a central portion of the rear face (320), accelerating electrons, thermionically emitted by a filament (178), onto the protruding portion of the rear face (320) of the button member, to heat the button member to cause thermionic emission of electrons from at least a central portion of the front face (322) of the button member corresponding to the central portion of the rear face, and electrically biasing the cathode to accelerate the thermionically emitted electrons from the front face (322) of the button member to ionize gas molecules in the arc chamber (76) to produce a plasma therein. See Horsky [372] abstract, figs. 2, 4,6a-7, 13a-13b, col. 1 lines 10-16, 40-67, col. 2 lines 10-67, col. 3 lines 1-30, col. 4 lines 30-55, col. 5 lines 1-30, col. 6 lines 35-60, col. 7 lines 5-65, col. 8 lines 20-35, col. 10 lines 13-67, and col. 11 lines 25-55.

Claim 19,22-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Horsky [372]. As per claim 19, Horsky [372] discloses an indirectly heated cathode (124) for an ion source comprising a button member having a front face (322) for emitting thermionic electrons, when in use, to form a plasma and a rear face (320) opposite to the front face (322) for exposure to electron heating in use, the button member comprising a collar piece (162, 326) and a slug piece (164,324) secured in the collar piece (162,326), the slug piece (164, 324) providing respective central portions of the front and rear faces (322,320) of the button member and the collar piece (162,326) providing respective peripheral portions of the front and rear faces (322,320) surrounding the central portions, the slug piece (164,324) being secured in the collar

piece (162,326) so as to reduce thermal conduction from the slug piece (164, 324) to the collar piece (162,326) and provide a temperature difference between the slug piece (163, 324) and the collar piece (162, 326) when the central portion of the rear face (320) of the button member is electron heated in use. See Horsky [372] abstract, figs. 2, 4,6a-8, 13a-13b, col. 1 lines 10-16, 40-67, col. 2 lines 10-67, col. 3 lines 1-30, col. 4 lines 30-55, col. 5 lines 1-30, col. 6 lines 35-60, col. 7 lines 5-65, col. 8 lines 20-35, col. 10 lines 13-67, and col. 11 lines 25-55.

As per claim 22, Horsky [372] discloses the slug piece (164,324) protruding rearward relative to the collar piece (162,326) so that the central portion of the rear face (322, 320) of the button member is rearward of the peripheral portion of the rear face (320). See Horsky [372] figs. 6, 6A, and col. 10 lines 12-67.

As per claim 23, Horsky [372] discloses the slug piece (324) and the collar piece (326) of the button member being made of the same material. See Horsky [372] figs. 6, 6A, and col. 10 lines 12-67.

Claim 24 is rejected under 35 U.S.C. 102(b) as being anticipated by Horsky [372]. As per claim 24, Horsky [372] discloses a method of creating a plasma for use in ion implantation, comprising the steps of providing an indirectly heated button cathode (124) having a button member with a front face (322) and a rear face (320), the button member comprising a collar piece (162) and a central slug piece (164) secured in the collar piece (162), the slug piece (164) providing respective central portions of the front and rear faces (322,320) and the collar piece (162) providing respective peripheral portions thereof, accelerating thermionic electrons preferentially onto the central portion

of the rear face (320) to heat the slug piece (164) relative to the collar piece (162) to cause thermionic emission of the electrons from the central portion of the front face (322), reducing thermal conduction from the slug piece (164) to the collar piece (162) to provide a temperature difference between the slug piece (164) and the collar piece (162), and electrically biasing the cathode to accelerate the thermionically emitted electrons from the front face (322) to ionize the gas molecules to produce a plasma. See Horsky [372] abstract, figs. 2,4,6-8, 13a-13b, col. 1 lines 10-16, 40-67, col. 2 lines 10-67, col. 3 lines 1-30, col. 4 lines 30-55, col. 5 lines 1-30, col. 6 lines 35-60, col. 7 lines 5-65, col. 8 lines 20-35, col. 10 lines 13-67, and col. 11 lines 25-55.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horsky [372] in view of Gattuso [969]. As per claim 1, Horsky [372] teaches a heated button cathode (124) for an ion source, comprising a button member having a front face (322) for emitting thermionic electrons, when in use, to form a plasma, the face (322) for emitting having a central portion (164) provided by a first material, and a peripheral portion (162), around the central portion (164), provided by a second material. See

Horsky [372] abstract, figs. 2, 4,6a-7, 13a-13b, col. 1 lines 10-16, 40-67, col. 2 lines 10-67, col. 3 lines 1-30, col. 4 lines 30-55, col. 5 lines 1-30, col. 6 lines 35-60, col. 7 lines 5-65, col. 8 lines 20-35, col. 10 lines 13-67, and col. 11 lines 25-55. However, Horsky [372] does not explicitly state the first material having thermionic work function less than the second material. Gattuso [969] teaches that it was known to have the electron-emitting portion of the cathode at a lower work function in order to increase thermal emission of the material. See Gattuso [969] col. 5 lines 40-61. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a first material that has a lower work function than the second material in order to increase thermal emission of the cathode as taught by Gattuso [969]. In addition, Horsky [372] teaches that second material forming a thermal break between the central electron portion and the metal mounting block which supports the cathode in order to reduce the heat transfer from the central portion and the peripheral portion. See Horsky [372] fig. 6, col. 2 lines 33-67, and col. 11 lines 25-55.

As per claim 2, Horsky [372] teaches the central portion (164) being circular and the second portion (162) being annular. See Horsky [372] figs. 6-7, 13-13B, and col. 2 lines 30-65.

As per claim 3, Horsky [372] teaches the button member comprising a collar (162) of the second material and a slug (164) of the first material secured in the collar (162). See Horsky [372] fig. 6, and col. 2 lines 33-67.

As per claim 4, Horsky [372] teaches the button member having a rear face (320) opposite to the front face (322), for exposure to electron heating in use, and the slug

(164) protruding rearwards relative to the collar (162). See Horsky [372] abstract, figs. 6-7, and col. 2 lines 33-67.

As per claim 5, Gattuso [969] teaches at least part of the face for emitting being concave. See Gattuso [969] figs. 35, and col. 5 lines 40-65. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have at least part of the face for emitting be concave in order to reduce the cross sectional area of the central portion, and thereby provide an increase current density of the arc current flowing into the arc chamber and a higher emitter end temperature.

As per claim 6, Gattuso [969] teaches the central portion of the face for emitting being concave. See Gattuso [969] figs. 35, and col. 5 lines 40-65. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have at least part of the face for emitting be concave in order to reduce the cross sectional area of the central portion, and thereby provide an increase current density of the arc current flowing into the arc chamber and a higher emitter end temperature.

As per claim 7, Horsky [372] in view of Gattuso [969] teach all aspects of the claim except for explicitly stating the second material being tungsten. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the second material be tungsten, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

As per claim 8, Horsky [372] in view of Gattuso [969] teach all aspects of the claim except for explicitly stating the first material being tantalum. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the first material be tantalum, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horsky [372] in view of Gattuso [969]. As per claim 9, Horsky [372] teaches an indirectly heated cathode for an ion source comprising a button member having a front face (322) for emitting thermionic electrons when in use, to form a plasma. See Horsky [372]. However, Horsky [372] does not specifically state at least part of the face for emitting being concave. Horsky [372] does however teach that it was known to reduce the cross sectional area of the emitter end. See Horsky [372] col. 11 lines 25-55. Gattuso [969] does teach the emitter end of an indirectly heated cathode being concave. See Gattuso [969] figs. 3,5, col. 5 lines 40-61, and col. 7 lines 20-25. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have at least part of the face for emitting be concave in order to reduce the cross sectional area of the emitting surface and provide a more efficient use of filament heating power.

As per claim 10, Horsky [372] teaches the front face (322) being circular having a concentric central portion and an annular outer portion. See Horsky [372] abstract, figs. 2, 4,6a-6c, 13a-13b, col. 1 lines 10-16, 40-67, col. 2 lines 10-67, col. 3 lines 1-30,

col. 4 lines 30-55, col. 5 lines 1-30, col. 6 lines 35-60, col. 7 lines 5-65, col. 8 lines 20-35, col. 10 lines 13-67, and col. 11 lines 25-55. However, Horsky [372] does not specifically state the only the central portion being concave. Gattuso [969] teaches the emitting portion of an indirectly heated cathode being concave. See Gattuso [969] figs. 3,5, col. 5 lines 40-61, and col. 7 lines 20-25. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have only the central portion be concave in order to reduce the cross sectional area of the emitting surface and provide a more efficient use of filament heating power.

Claims 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Horsky [372] in view of Gattuso [969]. As per claim 14, Horsky [372] teaches a method of creating a plasma for use in ion implantation comprising providing an arc chamber (76) with an indirectly heated button cathode having a button member with a front face (322) for emitting thermionic electrons into the arc chamber (76) for acceleration therein to form a plasma, forming a central portion (164) of the face (322) for emitting with a first material having a first thermionic work function, forming a peripheral portion (162) of the face (322), around the central portion (164), with a second material, accelerating electrons, thermionically emitted by a filament (178) onto a rear face (320) of the button member opposite to the front face (322), to heat the button member to cause thermionic emission of the electrons from at least the central portion (164) of the front face (322) of the button member, and electrically biasing the cathode to accelerate the thermionically emitted electrons from the front face (322) of the button member to ionize gas molecules in the arc chamber (76) to produce plasma. See Horsky [372] abstract, figs.

2, 4,6a-7, 13a-13b, col. 1 lines 10-16, 40-67, col. 2 lines 10-67, col. 3 lines 1-30, col. 4 lines 30-55, col. 5 lines 1-30, col. 6 lines 35-60, col. 7 lines 5-65, col. 8 lines 20-35, col. 10 lines 13-67, and col. 11 lines 25-55. However, Horsky [372] does not explicitly state the first material having thermionic work function less than the second material. Gattuso [969] teaches that it was known to have the electron-emitting portion of the cathode at a lower work function in order to increase thermal emission of the material. See Gattuso [969] col. 5 lines 40-61. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a first material that has a lower work function than the second material in order to increase thermal emission of the cathode as taught by Gattuso [969]. In addition, Horsky [372] teaches that second material forming a thermal break between the central electron portion and the metal mounting block which supports the cathode in order to reduce the heat transfer from the central portion and the peripheral portion. See Horsky [372] fig. 6, col. 2 lines 33-67, and col. 11 lines 25-55.

Claims 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Horsky [372] in view of Gattuso [969]. As per claim 14, Horsky [372] teaches a method of creating a plasma for use in ion implantation comprising providing an arc chamber (76) with an indirectly heated button cathode having a button member with a front face (322) for emitting thermionic electrons into the arc chamber (76) for acceleration therein to form a plasma, accelerating electrons, thermionically emitted by a filament (178) onto a rear face (320) of the button member to cause thermionic emission of electrons from at least part of the front face (322) of the button member, and electrically biasing the

cathode to accelerate the thermionically emitted electrons from the front face (322) of the button member to ionize gas molecules in the arc chamber (76) to produce plasma therein. See Horsky [372] abstract, figs. 2, 4,6a-7, 13a-13b, col. 1 lines 10-16, 40-67, col. 2 lines 10-67, col. 3 lines 1-30, col. 4 lines 30-55, col. 5 lines 1-30, col. 6 lines 35-60, col. 7 lines 5-65, col. 8 lines 20-35, col. 10 lines 13-67, and col. 11 lines 25-55. However, Horsky [372] does not specifically state forming at least part of the face (322) for emitting to be concave nor having the thermionic emission of electron come from at least the concave part of the front face (322) of the button member. Horsky [372] does however teach that it was known to reduce the cross sectional area of the front face (322) in order to provide for a more efficient use of filament heating power. See Horsky [372] col. 11 lines 25-55. In addition, Gattuso [969] teaches at least part of the face for emitting being concave. See Gattuso [969] figs. 35, and col. 5 lines 40-65. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have at least part of the front face for emitting be concave in order to reduce the cross sectional area of the central portion, and thereby provide an increase current density of the arc current flowing into the arc chamber and a higher emitter end temperature.

Claims 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horsky [372] in view of Gattuso [969]. As per claim 1, Horsky [372] teaches an ion source comprising an arc chamber (76) having first and second opposed walls (130c, 130d) an indirectly heated button cathode located in the first wall, an electron reflector (180) located in the second wall, the button cathode having a disc-shaped button

member (164) with generally circular front face (322) for emitting thermionic electrons, when in use, to form a plasma in the arc chamber (76), the front face (322) for emitting having a central portion (164) provided by a first material having a first work function and a peripheral portion (162), around the central portion (164), and the electron reflector (180) having a disc-shaped head member (181) providing a generally circular reflecting face formed of a material. Horsky [372] further teaches the ion source further comprising a magnet to provide a magnetic field in the arc chamber aligned between the front face (322) of the button member and the reflecting face (320) of the head member to confine electrons to a column extending in the arc chamber (76) between the cathode (124) and the electron reflector (180). See Horsky [372] abstract, figs. 2,4,6-8,13a-13b, col. 1 lines 10-16, 40-67, col. 2 lines 10-67, col. 3 lines 1-30, col. 4 lines 32-50, col. 5 lines 1-30, 50-65, col. 6 lines 35-60, col. 7 lines 5-67, col. 8 lines 1-46, col. 10 lines 10-67, and col. 11 lines 25-55. However, Horsky [372] does not explicitly state the first material having thermionic work function less than the second material nor the reflector being made of the first material. Gattuso [969] teaches that it was known to have the electron-emitting portion of the cathode at a lower work function in order to increase thermal emission of the material. See Gattuso [969] col. 5 lines 40-61. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a first material that has a lower work function than the second material in order to increase thermal emission of the cathode as taught by Gattuso [969]. In addition, Horsky [372] teaches that second material forming a thermal break between the central electron portion and the metal mounting block which

supports the cathode in order to reduce the heat transfer from the central portion and the peripheral portion. See Horsky [372] fig. 6, col. 2 lines 33-67, and col. 11 lines 25-55. With regards to the applicants' claim that the reflector be made of the first material, it would have been obvious to one having ordinary skill in the art at the time the invention was made to the reflector be made of the first material, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

As per claim 18, Horsky [372] in view of Gattuso [969] teach all aspects of the claim except for stating that the first material is tantalum and the second material is tungsten. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the first material be tantalum and the second material be tungsten, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

Claims 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horsky [372]. As per claim 21, Horsky [372] teaches the collar piece (162) having a central bore accommodating the slug piece (164), the central bore having an inner end having a reduced diameter. See Horsky [372] figs. 2,6-8, 13-13b, col. 6 lines 35-65, col. 7 lines 5-67, and col. 10 lines 10-67. However, Horsky [372] does not specifically teach the slug piece (164) being shrink fit in the reduced diameter inner end of the bore. Horsky [372] does however, teach the slug (164) being press fitted in the reduced diameter inner end of the bore. See Horsky [372] col. 10 lines 20-50. Therefore, it

would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the slug piece (164) be shrink fitted in the reduced diameter inner end of the bore since the examiner takes official notice of the equivalence of shrink fitting and press fitting for their use in the fitting/securing art and the selection of any of these known equivalents to fitting/securing cathodes in holes would be within the level of ordinary skill in the art.

Claim 20 is rejected as being dependent on a rejected base claim.

Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Horsky [372]. As per claim 25, Horsky [372] teaches a method of forming a button member for an indirectly heated cathode for an ion source, the button member having a front face (322) for emitting thermionic electrons, when in use, to form a plasma and a rear face (320) opposite the front face for exposure to electron heating in use, the method comprising the steps of; providing a collar piece (162) and a slug piece (164) for securing in the collar piece (162) so that the slug piece (164) provides respective peripheral portions of the front and rear faces (322,320) surrounding the central portions, the collar piece (162) having a central bore to accommodate the slug piece (164) wherein the central bore has and inner end having a reduced diameter. See Horsky [372] abstract, figs. 2,4,6-8,13a-13b, col. 1 lines 10-16, 40-67, col. 2 lines 10-67, col. 3 lines 1-30, col. 4 lines 32-50, col. 5 lines 1-30, 50-65, col. 6 lines 35-60, col. 7 lines 5-67, col. 8 lines 1-46, col. 10 lines 10-67, and col. 11 lines 25-55. However, Horsky [372] does not specifically teach cooling the slug piece (164) in liquid nitrogen to shrink fit the slug piece (164) into the reduced diameter inner end of the bore in the

collar piece (162). Instead, Horsky [372] teaches the slug (164) being press fitted into the collar piece (162). See Horsky [372] col. 10 lines 19-45. It would have been obvious to one having ordinary skill in the art at the time the invention was made to cool the slug piece in liquid nitrogen to shrink fit the slug piece into the reduced diameter inner end of the bore in the collar piece, since the examiner takes official notice of the equivalence of shrink fitting and press fitting for the use in the art of securing objects in holes with diameters that are generally same as the diameter of the object being secured and the selection of any of these known equivalents to securing objects in holes would be within the level of ordinary skill in the art.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent Nos. 6,583,544 to Horsky et al, and 5,763,890 to Cloutier et al are considered pertinent. Horsky [544] is considered pertinent because of its teaching on an ion source having replaceable and sputterable solid source material. Cloutier [890] is considered pertinent because of its teaching on a cathode mounting for ion source with indirectly heated cathode.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony Quash whose telephone number is (703)-308-6555. The examiner can normally be reached on M-F from 9 a.m. to 5 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee, can be reached on (703)-308-4116. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)-308-0956.

A. Quash 6/28/03

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